

An Intrahospital Information System Supporting Immediate Pathological Diagnosis and Decision-Making during Surgery

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Background. Surgeons sometimes need immediate pathological diagnosis of specimens during surgery even if the preoperative diagnosis was based on every possible biopsy, CT and MRI, etc. They have to widen the surgical margins if the cut face of the removed organ is microscopically invaded by malignant cells. Especially in some brain tumors, since preoperative biopsy is usually very difficult, the decision-making as to an operation depends on the pathological diagnosis of specimens obtained during surgery. Moreover, pathologists often need detailed discussion with surgeons before giving a diagnosis. Were microscopic images and surgical views to be viewed by both surgeons and pathologists, such discussion would be far more fruitful and efficient. Thus, the development of an intrahospital system to support the immediate pathological diagnosis and decision-making during a surgery has considerable and growing importance.

A method for rapid transport of specimens and an interactive system with high-resolution images are needed. A high-definition television (HDTV) with 1125 scanning lines was developed in the Japanese Broadcasting Corporation, NHK (1), and has been introduced to medical information systems as tele-pathology and telemedicine (2,3). The quality of images from microscopes, X-ray apparatus and other equipment was very good for telepathology and telemedicine in these reports. We combined the HDTV system with a pneumatic tube system which transports a small specimen within mere seconds.

System. The system connects three separate areas; two laboratories of pathology in the university and hospital, and the operating rooms; these three areas are almost 500 m apart. The laboratories have two microscopes (BX50, Olympus, Japan) with CCD cameras (DK-H2, Hitachi, Japan), and two color monitors (CM-H2121, Hitachi). The operating rooms are also equipped with the color monitors (CM-H2121). The HDTV system allowed two histological views to be seen in succession. The entire system is controlled by a UNIX workstation (SPARC station 5, Sun Microsystems, USA). The surgical pictures and voice are transmitted by a conventional video system. The specimens obtained during the surgery are transported by a pneumatic tube system (Nippon Air Shooter Co. Ltd., Japan) which connects the laboratory and operating rooms. When a specimen arrives at the laboratory, frozen sections are immediately stained, and the communication is started as soon as possible between surgeons and pathologists. They scrutinize the histological images on HDTVs and discuss them using an arrow pointer. More specimens are sometimes requested. Thus a decision is made during the actual surgery.

Evaluation. The system was inaugurated in May 1996, and an immediate pathological diagnosis was sought in one hundred and thirty-six surgery cases (Table) in this 10 months. In 13% of the above cases, urgent communication between surgeons and pathologists was carried out to determine whether the surgical margins should be enlarged. Pictures of surgery and the images of histology were very important for the discussion, leading to appropriate decision-making for surgery. The delay of surgery due to pathological diagnosis and discussion averaged 10 to 15 minutes.

Conclusions. An intrahospital system with HDTVs and pneumatic tube system was started at May 1996 in the Gunma University Hospital. The systems have proven quite useful for immediate pathological diagnosis and decision-making during the surgery.

Table Cases for immediate pathological diagnosis during this 10 months.

Specimens	n
Brain and hypophysis	27
Organs of head or neck	26
Digestive organs	29
Ovarium	17
Lung	17
Miscellaneous organs	20

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